SECTION 1: IDENTIFICATION OF THE PRODUCT AND OF THE COMPANY

1.1 Product identifiers
Product Name: ACS Material Upconverting Nanoparticles
Brand: ACS Material LLC
CAS-No.: 7681-49-4 (Sodium fluoride), 64-17-5 (Ethanol)

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses: Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet
Company: ACS MATERIAL LLC
959 E Walnut St., Suite 100
Pasadena, CA 91106
USA
Telephone: +1 (866)-227-0656
Fax: +1 (781)-518-0284

1.4 Emergency telephone number
Emergency Phone #: +1 (866)-227-0656

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
GHS Classification
Flammable liquids (Category 2)
Acute toxicity, Oral (Category 2)
Skin corrosion/irritation (Category 2)
Serious eye damage/eye irritation (Category 2A)
Acute aquatic toxicity (Category 3)
Specific target organ toxicity - single exposure (Category 3)

2.2 GHS Label elements, including precautionary statements
Pictogram

Signal word: Danger

Hazard statement(s)
H225 Highly flammable liquid and vapour.
H300 Fatal if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H402  Harmful to aquatic life.

Precautionary statement(s)

P210  Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233  Keep container tightly closed.
P240  Ground and bond container and receiving equipment.
P241  Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242  Use non-sparking tools.
P243  Take action to prevent static discharges.
P261  Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264  Wash skin thoroughly after handling.
P270  Do not eat, drink or smoke when using this product.
P273  Avoid release to the environment.
P280  Wear eye protection/ face protection. Wear protective gloves.
P301 + P310 + P330  IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352  IF ON SKIN: Wash with plenty of water.
P303 + P361 + P353  IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P305 + P351 + P338  IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P332 + P313  If skin irritation occurs: Get medical advice/ attention.
P337 + P313  If eye irritation persists: Get medical advice/ attention.
P370 + P378  In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235  Store in a well-ventilated place. Keep cool.
P405  Store locked up.
P501  Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Target Organs
Damage to the heart, liver, nervous system, kidney, bone, gastrointestinal tract, teeth, lungs.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

<table>
<thead>
<tr>
<th>Substance name</th>
<th>ACS Material Upconverting Nanoparticles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formula</td>
<td>NaYREF₄(RE: Yb, Er, Tm, Gd, Mn, Lu)</td>
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<tr>
<td>Substance</td>
<td>Ethanol</td>
</tr>
<tr>
<td>Synonyms</td>
<td>Ethyl alcohol</td>
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<tr>
<td>CAS-No.</td>
<td>64-17-5</td>
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<tr>
<td>EC-No.</td>
<td>200-578-6</td>
</tr>
<tr>
<td>Molecular weight</td>
<td>46.07 g/mol</td>
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<tr>
<td>Formula</td>
<td>C₂H₆O</td>
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</table>
Substance: Sodium fluoride  
CAS-No.: 7681-49-4  
EC-No.: 231-667-8  
Molecular weight: 41.99 g/mol  
Formula: NaF

Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Concentration</th>
<th>CAS-No.</th>
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<tbody>
<tr>
<td>Ethanol</td>
<td>99.9 wt %</td>
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<tr>
<td>Sodium fluoride</td>
<td>&lt; 0.1 wt %</td>
<td>7681-49-4</td>
</tr>
<tr>
<td>Yttrium</td>
<td>&lt; 0.1 wt %</td>
<td>7440-65-5</td>
</tr>
<tr>
<td>Ytterbium</td>
<td>&lt; 0.1 wt %</td>
<td>7440-64-4</td>
</tr>
<tr>
<td>Erbium</td>
<td>&lt; 0.1 wt %</td>
<td>7440-52-0</td>
</tr>
<tr>
<td>Thulium</td>
<td>&lt; 0.1 wt %</td>
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<tr>
<td>Gadolinium</td>
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<tr>
<td>Manganese</td>
<td>&lt; 0.1 wt %</td>
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</tr>
<tr>
<td>Lutetium</td>
<td>&lt; 0.1 wt %</td>
<td>7439-94-3</td>
</tr>
</tbody>
</table>

For the full text of the phrases mentioned in this Section, see Section 16.

Hazardous impurities: None known.

SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled
If inhaled, remove to fresh air. If not breathing, give artificial respiration. Get medical attention.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician. First treatment with calcium gluconate paste.

In case of eye contact
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

4.3 Indication of any immediate medical attention and special treatment needed
No data available.

SECTION 5: FIREFIGHTING MEASURES

5.1 Extinguishing media
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Hazards arising from the substance or mixture
Hazardous decomposition products formed under fire conditions. - Carbon oxides, hydrogen fluoride, sodium oxides, yttrium oxides, ytterbium oxides, erbium oxides, gadolinium oxides, manganese/manganese oxides.

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Conditions of flammability
Flammable in the presence of a source of ignition when the temperature is above the flash point. Keep away from heat/sparks/open flame/hot surface. No smoking.

5.5 Further information
Use water spray to cool unopened containers.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
Keep in suitable, closed containers for disposal. For disposal see section 13.

SECTION 7: HANDLING AND STORAGE
7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Do not store near acids. Hygroscopic. Keep at 4-8 °C. Light, and moisture sensitive.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters
Components with workplace control parameters

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control Parameters</th>
<th>Basis</th>
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<tr>
<td>Ethanol</td>
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<td>TWAEV</td>
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<tr>
<td></td>
<td></td>
<td>TWA</td>
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<td>Sodium fluoride</td>
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<td>TWAEV</td>
<td>1,000 ppm 1,880 mg/m³</td>
<td>Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible exposure values for airborne contaminants</td>
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<td></td>
<td></td>
<td>STEL</td>
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<td>Canada. British Columbia OEL</td>
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<td></td>
<td>TWA</td>
<td>1,000.000000 ppm</td>
<td>Canada. British Columbia OEL</td>
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<tr>
<td></td>
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<td>TWA</td>
<td>1,000.000000 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
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<tr>
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<td>Yttrium 7440-65-5</td>
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</table>
8.2 Exposure controls
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Appropriate engineering controls
Use mechanical exhaust or laboratory fumehood to avoid exposure.

Personal protective equipment

**Eye/face protection**
Use equipment for eye protection, face shield and safety glasses tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove’s outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

**Body Protection**
Impervious clothing, Flame retardant antistatic protective clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Do not let product enter drains.

---

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES
9.1 Information on basic physical and chemical properties

1) Appearance
   Form: Dispersion
   Colour: Ivory white

2) Odour
   Odourless

3) Odour Threshold
   No data available

4) pH
   No data available

5) Melting point/freezing point
   Melting point/range: -114 °C (-173 °F)

6) Initial boiling point and boiling range
   78 °C (172 °F)

7) Flash point
   14.0 °C (57.2 °F) - closed cup

8) Evaporation rate
   No data available

9) Flammability (solid, gas)
   May be combustible at very high temperature

10) Upper/lower flammability or explosive limits
    Upper explosive limit: 19 % (V)
    Lower explosive limit: 3.3 % (V)

11) Vapour pressure
    59.5 hPa (44.6 mmHg) at 20.0 °C (68.0 °F)

12) Vapour density
    No data available

13) Relative density
    0.789 g/cm³ at 25 °C (77 °F)

14) Water solubility
    Completely soluble

15) Partition coefficient: n-octanol/water
    log Pow: -0.349 at 24 °C (75 °F)

16) Auto-ignition temperature
    363 °C (685 °F)

17) Decomposition temperature
    No data available

18) Viscosity
    No data available

19) Explosive properties
    No data available

20) Oxidizing properties
    No data available

9.2 Other safety information
   No data available.

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity
    No data available.

10.2 Chemical stability
    Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
    Vapours may form explosive mixture with air.

10.4 Conditions to avoid
    Heat, spark and flame. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
    Alkali metals, oxidizing agents, peroxides, strong acids, halogens, oxygen, phosphorus, sulphur oxides.
10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, hydrogen fluoride, sodium oxides, ytterbium oxides, erbium oxides, gadolinium oxides, manganese/manganese oxides.

Other decomposition products - Gaseous hydrogen fluoride (HF).
In the event of fire: see section 5.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50: No data available.
LC50: No data available.
Dermal: No data available.
Intravenous - Rat - Nutritional and Gross Metabolic: Weight loss or decreased weight gain.

Skin corrosion/irritation
Irritating to skin.

Serious eye damage/eye irritation
Eyes - Rabbit - Moderate eye irritation.

Respiratory or skin sensitisation
No data available.

Germ cell mutagenicity
No data available.

Carcinogenicity
Carcinogenicity - Mouse – Oral
Carcinogenicity - Rat - Intramuscular
Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Liver: Tumors.


IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity
Reproductive toxicity - Human - female - Oral
Effects on Newborn: Apgar score (human only). Effects on Newborn: Other neonatal measures or effects. Effects on Newborn: Drug dependence.

Specific target organ toxicity - single exposure
No data available.

Specific target organ toxicity - repeated exposure
No data available.

Aspiration hazard
No data available.
Potential health effects

**Inhalation**  May be harmful if inhaled. Causes respiratory tract irritation. Vapours may cause drowsiness and dizziness.

**Ingestion**  May be fatal if swallowed. Aspiration hazard if swallowed – can enter lungs and cause damage.

**Skin**  May be harmful if absorbed through skin. May cause skin irritation.

**Eyes**  Causes eye irritation.

**Signs and Symptoms of Exposure**
Central nervous system depression, narcosis, Damage to the heart., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Fluoride ion can reduce serum calcium levels possibly causing fatal hypocalcemia. Rare earth compounds may cause delayed blood clotting leading to hemorrhages. Inhalation of rare earths may cause sensitivity to heat, itching, and increased awareness of odor and taste.

**Additional Information**
RTECS: KQ6300000(Ethanol).

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

**SECTION 12: ECOLOGICAL INFORMATION**

12.1 **Toxicity**
No data available.

12.2 **Persistence and degradability**
No data available.

12.3 **Bioaccumulative potential**
Bioaccumulation - Salmo trutta

12.4 **Mobility in soil**
No data available.

12.5 **Results of PBT and vPvB assessment**
No data available.

12.6 **Other adverse effects**
Harmful to aquatic life.

**SECTION 13: DISPOSAL CONSIDERATIONS**

13.1 **Waste treatment methods**

**Product**
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care
in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

**Contaminated packaging**
Dispose of as unused product.

### SECTION 14: TRANSPORT INFORMATION

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<tbody>
<tr>
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<td>IMDG: 1170</td>
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<td>IATA: 1170</td>
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<th>Packaging group</th>
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<td>IATA: -</td>
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<table>
<thead>
<tr>
<th>Environmental hazards</th>
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<tbody>
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<td>ADR/RID: no</td>
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<tr>
<td>IMDG Marine pollutant: no</td>
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<tr>
<td>IATA: no</td>
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<table>
<thead>
<tr>
<th>Special precautions for user</th>
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<tr>
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### SECTION 15: REGULATORY INFORMATION

#### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

<table>
<thead>
<tr>
<th>Authorisations and/or restrictions on use</th>
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<tbody>
<tr>
<td>WHMIS Classification</td>
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<table>
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<th>IMDG</th>
<th>IATA</th>
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<tbody>
<tr>
<td>B2</td>
<td>Flammable liquid</td>
<td>Flammable liquid</td>
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</tr>
<tr>
<td>B1</td>
<td>Toxic by inhalation</td>
<td>Toxic by inhalation</td>
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<tr>
<td>D2A</td>
<td>Toxic by ingestion</td>
<td>Toxic by ingestion</td>
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<tr>
<td>D2B</td>
<td>Reproductive hazard</td>
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<td>D3</td>
<td>Moderate skin irritant</td>
<td>Moderate skin irritant</td>
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<tr>
<td>D4</td>
<td>Moderate eye irritant</td>
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### SECTION 16: OTHER INFORMATION

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<tr>
<td>Flammability: 3</td>
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<td>Physical Hazard: 0</td>
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Disclaimer: ACS Material, LLC believes that the information in this Safety Data Sheet is accurate and represents the best and most current information available to us. ACS Material makes no representations or warranties either express or implied, regarding the suitability of the material for any purpose or the accuracy of the information contained within this document. Accordingly, ACS Material will not be responsible for damages resulting from use of or reliance upon this information.